**Patent Claims**

1. A light source comprising a microstructured optical element that receives and spectrally spreads the light from a primary light source, characterized in that the spectrally spread light traverses at least one further microstructured optical element.

2. The light source as claimed in claim 1, characterized in that the microstructured optical element and/or the further microstructured optical element contains photonic band gap material.

3. The light source as claimed in either of claims 1 and 2, characterized in that the microstructured optical element and/or the further microstructured optical element are/is designed as optical fiber(s).

4. The light source as claimed in claim 3, characterized in that the microstructured optical element and/or the further microstructured optical element have/has a taper (tapered fiber).

5. The light source as claimed in claim 3, characterized in that the microstructured optical element and the further microstructured optical element merge into one another continuously.

6. The light source as claimed in one of claims 1 to 5, characterized in that the microstructured optical element and/or the further microstructured optical element are/is a photonic crystal fiber (microstructured fiber, holey fiber).

7. The light source as claimed in one of claims 1 to 6, characterized in that the microstructured optical element and the further microstructured optical element are spliced together.

8. The light source as claimed in one of claims 1 to 5, characterized in that the light that emerges from the microstructured optical element can be coupled into the further microstructured optical element with the aid of a lens arrangement.

9. The light source as claimed in one of claims 1 to 8, characterized in that the primary light source comprises a pulsed laser.

10. The light source as claimed in one of claims 1 to 9, characterized in that the light from the primary light source repeatedly traverses the microstructured optical element and/or the further microstructured optical element.

11. The light source as claimed in one of claims 1 to 9, characterized in that means are provided for selecting light components over at least one wavelength and/or at least one wavelength region.

12. The light source as claimed in one of claims 1 to 11, characterized by use in a flow cytometer or an endoscope or a chromatograph or a lithography apparatus.

13. A microscope having a light source as claimed in one of claims 1 to 11.

14. A scanning microscope having a light source as claimed in one of claims 1 to 11.

15. The scanning microscope as claimed in claim 14, characterized in that the scanning microscope is a confocal scanning microscope and/or a double confocal scanning microscope and/or an STED scanning microscope

and/or an STED-4Pi scanning microscope and/or a CARS scanning microscope.

16. A method for generating illuminating light, characterized by the following steps:

- generating spectrally spread light with the aid of a light source as claimed in one of claims 1 to 11,
- selecting at least one illuminating light wavelength and/or at least one illuminating light wavelength region, and
- splitting off the illuminating light of the at least one illuminating light wavelength and/or of the at least one illuminating light wavelength region from the spectrally spread light.

17. The method as claimed in claim 16, characterized in that the illuminating light optically excites a sample.

18. The method as claimed in either of claims 16 and 17, characterized by the further step of:

- selecting at least one further illuminating light wavelength and/or at least one further illuminating light wavelength region, and
- splitting off further illuminating light of the at least one further illuminating light wavelength and/or of the at least one further illuminating light wavelength region from the spectrally spread light.

19. The method as claimed in claim 18, characterized in that the further illuminating light effects a stimulated emission.

20. The use of the method as claimed in one of claims 16 to 19 in STED microscopy.

21. The use of the method as claimed in one of claims 16 to 19 for carrying out pump-probe experiments.